



US006023094A

**United States Patent** [19]

Kao et al.

[11] **Patent Number:** **6,023,094**[45] **Date of Patent:** **Feb. 8, 2000**

[54] **SEMICONDUCTOR WAFER HAVING A  
BOTTOM SURFACE PROTECTIVE  
COATING**

63-285955 11/1988 Japan ..... 257/790  
4-116955 4/1992 Japan ..... 257/797

[75] **Inventors:** **Pai-Hsiang Kao**, Saratoga; **William  
Jeffrey Schaefer**, San Jose; **Nikhil  
Vishwanath Kelkar**, Santa Clara, all of  
Calif.

*Primary Examiner*—Sheila V. Clark  
*Attorney, Agent, or Firm*—Beyer & Weaver, LLP

[73] **Assignee:** **National Semiconductor Corporation**,  
Santa Clara, Calif.

[57] **ABSTRACT**

[21] **Appl. No.:** **09/006,759**

[22] **Filed:** **Jan. 14, 1998**

[51] **Int. Cl.<sup>7</sup>** ..... **H01L 23/58**

[52] **U.S. Cl.** ..... **257/632; 257/783; 257/797**

[58] **Field of Search** ..... **257/797, 790,  
257/786, 783, 632**

Disclosed is a packaged integrated circuit device. The device includes a die having a plurality of electrical contacts on a first surface of the die and a protective film adhered directly to a back surface of the die, the protective film being thick enough to allow laser marking of the protective film without the laser penetrating to the die. In one preferred embodiment, the protective film of the device is a thick film formed by screen printing. In a preferred embodiment, the protective film has a thickness of between about 1.5 and 5 mils. Also, disclosed is a method of fabricating a semiconductor wafer having a wafer substrate with a top surface and a bottom surface and a plurality of dies. In this embodiment, the method includes providing a plurality of dies on the top surface of the wafer substrate, applying a thick film over the bottom surface of the wafer substrate, adhering the thick film to a mounting tape that is not ultraviolet curable, and dicing the wafer to separate the dies. The thick film reduces chipping along edges of the separated dies.

[56] **References Cited****U.S. PATENT DOCUMENTS**

4,560,580 12/1985 Needham et al. .  
5,083,191 1/1992 Ueda .  
5,294,812 3/1994 Hashimoto et al. .... 257/786

**FOREIGN PATENT DOCUMENTS**

61-84824 4/1986 Japan ..... 257/797

**6 Claims, 3 Drawing Sheets**